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EXAMINER	
COUGHLAN, PETER D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/825,032	**Applicant(s)** HAUDRICH ET AL.	
	Examiner PETER COUGHLAN	**Art Unit** 2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 17-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13 and 17-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *4/14/2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Detailed Action

1. Claims 1-13, 17-50 are pending in this application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 6-9, 33, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Boller in view of Luxhoj, in view of Mehrotra. ('Materials Mechanics – The Basis of Advanced Technology for Ageing Aircraft', referred to as **Boller**; 'Integrated decision support for aviation safety inspectors', referred to as **Luxhoj**; 'Elements of Artificial Neural Networks', referred to as **Mehrotra**)

Claim 1

Boller teaches an input module configured to receive one or more input parameters associated with aeroelastic characteristics of a structure. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Input module' of applicant is disclosed by the output of the sensors in Fig. 14 of Boller. 'Aeroelastic characteristics' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach the one or more input parameters relating to a completed repair of the structure.

Luxhoj teaches the one or more input parameters relating to a completed repair of the structure. (**Luxhoj,** p382:1-24; 'Completed repair' of applicant is equivalent to 'repaired structures' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by inputting data as taught by Luxhoj to have one or more input parameters relating to a completed repair of the structure.

For the purpose of being able to use the invention.

Boller teaches a neural network module coupled to the input module (**Boller,** Fig. 14, p396, C2:19-34, abstract; Boller uses sensors which produce data and neural networks to analyze data, then it is inherent that there exists some 'input module' which take data from the sensor to input into the neural network of Boller.) and configured to generate a transformation of the one or more input parameters to produce at least one aeroelastic analysis result. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller and Luxhoj do not teach the transformation based in part on a trained neural network.

Mehrotra teaches the transformation based in part on a trained neural network. (**Mehrotra,** p103:1 through p104:16; 'Trained neural network' of applicant is accomplished by 'back propagation' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using a neural network as taught by Mehrotra to have the transformation based in part on a trained neural network.

For the purpose of using the strength of classification by a neural network for reliable results.

Boller does not teach wherein the at least one aeroelastic analysis result may be used to determine whether the aeroelastic characteristics of the structure with the completed repair are acceptable.

Luxhoj teaches wherein the at least one aeroelastic analysis result may be used to determine whether the aeroelastic characteristics of the structure with the completed repair are acceptable. (**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by finding aeroelastic analysis as taught by Luxhoj to have wherein the at least one aeroelastic analysis result may be used to determine whether the aeroelastic characteristics of the structure with the completed repair are acceptable.

For the purpose of finding a critical element is safety and performance.

Claim 2

Boller does not teach an output module coupled to the neural network module, and configured to output the at least one aeroelastic analysis result.

Luxhoj teaches an output module coupled to the neural network module, and configured to output the at least one aeroelastic analysis result. (**Luxhoj,** p390:18 through p391:6; 'Output module' of applicant is inherent by the ability to 'output values of a PNN' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by having some output bus for outputting aeroelastic analysis as taught by Luxhoj to have an output module coupled to the neural network module, and configured to output the at least one aeroelastic analysis result.

For the purpose of having a portal in which critical data concerning safety and performance is produced.

Claim 6

Boller and Luxhoj do not teach a weight vector module configured to multiply the one or more input parameters by a weighting vector to generate one or more weighted parameters; a bias module configured to provide a scalar bias value, a summer coupled to the weight vector module and the bias module and configured to output a sum of the

one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

Mehrotra teaches a weight vector module configured to multiply the one or more input parameters by a weighting vector to generate one or more weighted parameters (**Mehrotra,** p11, Figure 1.5; 'Weight vector module' of applicant is equivalent to 'the input nodes in which the values x_1 through x_n are placed.); a bias module configured to provide a scalar bias value (**Mehrotra,** p11, Figure 1.5; 'Bias module' of applicant is the weights w_1 through w_n of Mehrotra.) a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value (**Mehrotra,** p11, Figure 1.5; The 'summer' of applicant is the summation of the products of all the x_is and w_is in node 'f' of Mehrotra.); and a transfer function module coupled to the summer and configured to apply a transfer function to the sum. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using standard algorithms within a neural network as taught by Mehrotra to have a weight vector module configured to multiply the one or more input parameters by a weighting vector to generate one or more weighted parameters; a bias module configured to provide a scalar bias value, a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

For the purpose of producing an accurate and reliable results.

Claim 7

Boller and Luxhoj do not teach wherein the transfer function comprises a non-linear transfer function.

Mehrotra teaches wherein the transfer function comprises a non-linear transfer function. (**Mehrotra,** p13:10 through p14:12; 'Non-linear transfer function' of applicant is equivalent to 'sigmoid function' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by being able to handle non-linear functions as taught by Mehrotra to have the transfer function comprises a non-linear transfer function.

For the purpose of being able to handle most real world situations which are non-linear.

Claim 8

Boller and Luxhoj do not teach wherein the transfer function comprises a tangent sigmoid function.

Mehrotra teaches wherein the transfer function comprises a tangent sigmoid function. (**Mehrotra,** p13:10 through p14:12; 'Tangent sigmoid function' of applicant is equivalent to 'sigmoid function' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined

teachings of Boller and Luxhoj by using a sigmoid function as taught by Mehrotra to have wherein the transfer function comprises a tangent sigmoid function.

For the purpose of using standard neural networks function which provide reliable results.

Claim 9

Boller and Luxhoj do not teach at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

Mehrotra teaches at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function. (**Mehrotra,** p13:10 through p14:12; 'Sigmoid' of applicant is equivalent to 'sigmoid function' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using a sigmoid function as taught by Mehrotra to have at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

For the purpose of using standard neural networks function which provide reliable results.

Claim 33

Boller does not teach wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft

Luxhoj teaches wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft. (**Luxhoj,** Fig. 4) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by using the invention of a aircraft section as taught by Luxhoj to have wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft

For the purpose of using the invention with an aircraft.

Claim 34

Boller and Luxhoj do not teach wherein the neural network is a feed forward neural network.

Mehrotra teaches wherein the neural network is a feed forward neural network. (**Mehrotra,** p103:1 through p104:16; 'Feed forward neural network' of applicant is equivalent to 'feedforward network' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using feed forward neural networks as

taught by Mehrotra to have wherein the neural network is a feed forward neural network.

For the purpose of using a reliable neural network design for accurate results.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Boller, Luxhoj and Mehrotra in view of Hampton. (U. S. Patent 4840069, referred to as **Hampton**)

Claim 3

Boller, Luxhoj and Mehrotra do not teach wherein the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

Hampton teaches wherein the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial. (**Hampton,** C5:5-12; ‘Switch’ of applicant is equivalent to ‘switch’ of Hampton.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by using physical devices of a computer as taught by Hampton to have wherein the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

For the purpose of being able to input data into the invention.

Claim 4

Boller, Luxhoj and Mehrotra do not teach wherein the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

Hampton teaches wherein the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector. (**Hampton,** C2:46-51; ‘Receiver’ of applicant is equivalent to ‘receiver’ of Hampton.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined

teachings of Boller, Luxhoj and Mehrotra by having physical monitoring devices as taught by Hampton to have wherein the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

For the purpose of measuring data from a physical structure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Boller, Luxhoj and Mehrotra in view of Hockey. (U. S. Patent 6014024, referred to as **Hockey**)

Claim 13

Boller, Luxhoj and Mehrotra do not teach wherein the at least one aeroelastic analysis result comprises a contour plot of store loads.

Hockey teaches wherein the at least one aeroelastic analysis result comprises a contour plot of store loads. (**Hockey,** Figure 7c, C1:29-36, C3:9-47; 'Contour plot' of applicant is equivalent to 'contour plot of Hockey.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by generating a contour plot as taught by Hockey to have wherein the at least one aeroelastic analysis result comprises a contour plot of store loads.

For the purpose of graphically displaying information to provide a visual interpretation of the input data.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 5, 10-12, 17-26, 28-32, 35-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Boller, Luxhoj and Mehrotra in view of NMAB_497. ('Small business innovation research to support aging aircraft', referred to as **NMAB_497**)

Claim 5

Boller, Luxhoj and Mehrotra do not teach wherein the one or more input parameters comprise: a weight; and a location of the weight on the structure.

NMAB_497 teaches wherein the one or more input parameters comprise: a weight; and a location of the weight on the structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting weight and location as taught by NMAB_497 to have wherein the one or more input parameters comprise: a weight; and a location of the weight on the structure.

For the purpose of checking the additional weight and or location does not effect the aircraft performance envelope

Claim 10

Boller, Luxhoj and Mehrotra do not teach wherein the at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

NMAB_497 teaches wherein the at least one aeroelastic analysis result comprises a flutter frequency at a damping value. (**NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural Dynamics and Aeroelasticity' section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by evaluating flutter frequency as taught by NMAB_497 to have wherein the at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

For the purpose of checking the repair does not exceed the flutter tolerances.

Claim 11

Boller, Luxhoj and Mehrotra do not teach wherein the at least one aeroelastic analysis result comprises a flutter speed at a damping value.

NMAB_497 teaches wherein the at least one aeroelastic analysis result comprises a flutter speed at a damping value. (**NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural

Dynamics and Aeroelasticity' section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by evaluating flutter speed as taught by NMAB_497 to have wherein the at least one aeroelastic analysis result comprises a flutter speed at a damping value.

For the purpose of checking the repair does not exceed the flutter tolerances.

Claim 12

Boller, Luxhoj and Mehrotra do not teach wherein the at least one aeroelastic analyses result comprises a flutter frequency and a corresponding flutter speed at a damping value.

NMAB_497 teaches wherein the at least one aeroelastic analyses result comprises a flutter frequency and a corresponding flutter speed at a damping value. (**NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural Dynamics and Aeroelasticity' section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary

skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by evaluate flutter speed and frequency as taught by NMAB_497 to have wherein the at least one aeroelastic analyses result comprises a flutter frequency and a corresponding flutter speed at a damping value.

For the purpose of checking the repair does not exceed the flutter speed and frequency tolerances.

Claim 17

Boller, Luxhoj and Mehrotra do not teach determining input parameters relating to one or more completed repairs performed on a structure.

NMAB_497 teaches determining input parameters relating to one or more completed repairs performed on a structure. (**NMAB-497,** p11:8-25; 'Input parameters' of applicant is illustrated by 'materials and processes' of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting repair information as taught by NMAB_497 to determine input parameters relating to one or more completed repairs performed on a structure.

For the purpose of using the neural networks ability to evaluate the repair conditions and parameters.

Boller and Luxhoj do not teach determining a training set of characteristic I/O pairs; generating a neural network.

Mehrotra teaches determining a training set of characteristic I/O pairs (**Mehrotra,** p103:1 through p104:16; 'Training set of characteristic I/O pairs' of applicant is equivalent to 'back propagation' of Mehrotra.); generating a neural network. (**Mehrotra,** Fig 4.20; 'Generating a neural network' of applicant is disclosed by the illustration of the tiling algorithm of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using training sets as taught by Mehrotra to have determining a training set of characteristic I/O pairs; generating a neural network.

For the purpose of obtaining a neural network with predictable results.

Boller does not teach training the neural network using the training set to generate a trained neural network.

Luxhoj teaches training the neural network using the training set to generate a trained neural network. (**Luxhoj,** p386:1 through p387:16; 'Trained neural network' of applicant is disclosed by having 'training sets of data patterns' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by employing a training set as taught by Luxhoj to training the neural network using the training set to generate a trained neural network.

For the purpose of having an neural network that can perform as expected.

Boller teaches determining aeroelastic characteristics of the structure based in part on the trained neural network **(Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic characteristics' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach determining whether the aeroelastic characteristics of the structure with the one or more completed repairs are acceptable.

Luxhoj teaches determining whether the aeroelastic characteristics of the structure with the one or more completed repairs are acceptable. (**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by using the invention to evaluate repairs as taught by Luxhoj to determining whether the aeroelastic characteristics of the structure with the one or more completed repairs are acceptable.

For the purpose of determining proper and acceptable repairs.

Claim 18

Boller and Luxhoj do not teach determining an accuracy of the aeroelastic characteristics determined using the trained neural network.

Mehrotra teaches determining an accuracy of the aeroelastic characteristics determined using the trained neural network. (**Mehrotra,** p103:1 through p104:16, , p29-3 through p30:31; 'Trained neural network' of applicant is accomplished by 'back propagation' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using a neural network as taught by Mehrotra to determining an accuracy of the aeroelastic characteristics determined using the trained neural network.

For the purpose of knowing what precision the neural network generates for a fair evaluation.

Claim 19

Boller and Luxhoj do not teach determining a weight vector in the trained neural network; and determining a bias value in the trained neural network.

Mehrotra teaches determining a weight vector in the trained neural network (**Mehrotra,** p11, Figure 1.5; 'Weight vector module' of applicant is equivalent to 'the input nodes in which the values x_1 through x_n are placed.); and determining a bias value in the trained neural network. (**Mehrotra,** p11, Figure 1.5, p65:1-33; 'Bias module' of applicant is the weights w_1 through w_n of Mehrotra. The 'trained neural network' is accomplished by 'backpropagation' method of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using weights as taught by Mehrotra to determine a weight vector in the trained neural network; and determining a bias value in the trained neural network.

For the purpose of using standard algorithms and methods within a neural network.

Claim 20

Boller and Luxhoj do not teach multiplying received input parameters by the weight vector to generate weighted parameters; summing the weighted parameters and

the bias value to generate a summed input; and applying the summed input to a transfer function associated with a neuron in the trained neural network.

Mehrotra teaches multiplying received input parameters by the weight vector to generate weighted parameters (**Mehrotra,** p11, Figure 1.5; The 'Multiplying received input parameters' of applicant is the multiplication of each x_is and w_is in node 'f' of Mehrotra.); summing the weighted parameters and the bias value to generate a summed input (**Mehrotra,** p11, Figure 1.5; The 'summing' of applicant is the summation of the products of all the x_is and w_is in node 'f' of Mehrotra.); and applying the summed input to a transfer function associated with a neuron in the trained neural network. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to 'f(w_1x_1 + ...+ w_nx_n)' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by generating a series of products by multiplying inputs with weights as taught by Mehrotra to multiplying received input parameters by the weight vector to generate weighted parameters; summing the weighted parameters and the bias value to generate a summed input; and applying the summed input to a transfer function associated with a neuron in the trained neural network.

For the purpose of using standard neural networks methodology for reliable results.

Claim 21

Boller, Luxhoj and Mehrotra do not teach receiving at least one input parameter related to a completed repair of an aircraft structure.

NMAB_497 teaches receiving at least one input parameter related to a completed repair of an aircraft structure. **(NMAB-497,** p11:8-25; 'Input parameters' of applicant is illustrated by 'materials and processes' of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting repair parameters as taught by NMAB_497 to receive at least one input parameter related to a completed repair of an aircraft structure.

For the purpose of using the invention to evaluate the repairs using a neural network.

Boller and Luxhoj do not teach applying a predetermined neural network transfer function.

Mehrotra teaches applying a predetermined neural network transfer function. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by viewing the output of a neural network as a transfer function as taught by Mehrotra to apply a predetermined neural network transfer function.

For the purpose of producing accurate classification.

Boller teaches to the at least one input parameter to generate an aeroelastic analysis result (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Input module' of applicant is

disclosed by the output of the sensors in Fig. 14 of Boller. 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the result.

Luxhoj teaches wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight. (**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.); and outputting the result. (**Luxhoj,** p390:18 through p391:6; 'Outputting the results' of applicant is equivalent to 'output values of a PNN' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by being able to certify a repair as taught by Luxhoj to have wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the result.

For the purpose of determining if the aircraft is safe to fly.

Claim 22

Boller, Luxhoj and Mehrotra do not teach wherein receiving at least one input parameter comprises: receiving a weight; and receiving location of the weight on the aircraft structure.

NMAB_497 teaches wherein receiving at least one input parameter comprises: receiving a weight; and receiving location of the weight on the aircraft structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting weight and location of repairs as taught by NMAB_497 to have wherein receiving at least one input parameter comprises: receiving a weight; and receiving location of the weight on the aircraft structure.

For the purpose of evaluating the repairs in regard to the aircraft performance and handling characteristics.

Claim 23

Boller and Luxhoj do not teach multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

Mehrotra teaches multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter **(Mehrotra,** p11, Figure 1.5;

The 'Multiplying received input parameters' of applicant is the multiplication of each x_is and w_is in node 'f' of Mehrotra.); summing together the at least one weighted input parameter and a bias value to generate a summed value (**Mehrotra,** p11, Figure 1.5; The 'summing' of applicant is the summation of the products of all the x_is and w_is in node 'f' of Mehrotra.); and applying a neuron transfer function to the summed value. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by generating a series of products and totaling them in step with standard neural network methods as taught by Mehrotra to multiply the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

For the purpose of producing accurate classification results.

Claim 24

Boller, Luxhoj and Mehrotra do not teach wherein the aeroelastic analysis result comprises a flutter speed at a damping value.

NMAB_497 teaches wherein the aeroelastic analysis result comprises a flutter speed at a damping value. (**NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural Dynamics and Aeroelasticity'

section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by evaluating flutter speed as taught by NMAB_497 to have wherein the aeroelastic analysis result comprises a flutter speed at a damping value.

For the purpose of determining if the repair alters the flutter speed tolerance levels.

Claim 25

Boller, Luxhoj and Mehrotra do not teach wherein the aeroelastic analysis result comprises a flutter frequency at a damping value.

NMAB_497 teaches wherein the aeroelastic analysis result comprises a flutter frequency at a damping value. **(NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural Dynamics and Aeroelasticity' section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the

combined teachings of Boller, Luxhoj and Mehrotra by evaluating flutter frequency as taught by NMAB_497 to have wherein the aeroelastic analysis result comprises a flutter frequency at a damping value.

For the purpose of determining if the repair alters the flutter frequency tolerance levels.

Claim 26

Boller, Luxhoj and Mehrotra do not teach wherein the aeroelastic analysis result comprises a flutter speed and an associated flutter frequency at a damping value.

NMAB_497 teaches wherein the aeroelastic analysis result comprises a flutter speed and an associated flutter frequency at a damping value. (**NMAB_497,** p29:3 through p30:31; 'Flutter frequency at a damping value' of applicant is described in the 'Structural Dynamics and Aeroelasticity' section of NMAB-497. Aerodynamic damping forces cause a structural motion that can lead to a dynamic instability called flutter. When aeroelastic mode sinks to zero and some critical speed, this is the flutter speed. 'Flutter frequency' of applicant is equivalent to 'aeroelastic mode' value of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by measuring flutter speed and frequency as taught by NMAB_497 to have wherein the aeroelastic analysis result comprises a flutter speed and an associated flutter frequency at a damping value.

For the purpose of determining if the repair alters the flutter frequency or speed tolerance levels.

Claim 28

Boller, Luxhoj and Mehrotra do not teach receiving at least one input parameter related to a completed repair of an aircraft structure.

NMAB_497 teaches receiving at least one input parameter related to a completed repair of an aircraft structure.(**NMAB-497,** p11:8-25; 'Input parameters' of applicant is illustrated by 'materials and processes' of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting repair information as taught by NMAB_497 to have receiving at least one input parameter related to a completed repair of an aircraft structure.

For the purpose of evaluating the repair to see if the repairs alter the aircraft flight characteristics.

Boller and Luxhoj do not teach applying a predetermined neural network transfer function.

Mehrotra teaches applying a predetermined neural network transfer function. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller

and Luxhoj by –viewing the neural network as a transfer function as taught by Mehrotra to apply a predetermined neural network transfer function.

For the purpose of producing accurate classification results.

Boller teaches to the at least one input parameter to generate an aeroelastic analysis result (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the result.

Luxhoj teaches wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight (**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.) ; and outputting the result. (**Luxhoj,** p390:18 through p391:6; 'Outputting the results' of applicant is equivalent to 'output values of a PNN' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by determining aeroelastic results as taught by Luxhoj to have wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the result.

For the purpose of determining if the aircraft is safe to fly.

Claim 29

Boller, Luxhoj and Mehrotra do not teach receiving a mass input related to a completed repair; receiving a location of the mass on an aircraft structure.

NMAB_497 teaches receiving a mass input related to a completed repair; receiving a location of the mass on an aircraft structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting mass and location data as taught by NMAB_497 to receiving a mass input related to a completed repair; receiving a location of the mass on an aircraft structure.

For the purpose of evaluating these two parameters of the aircraft performance envelope.

Boller and Luxhoj do not teach multiplying the mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value; applying a neuron transfer function.

Mehrotra teaches multiplying the mass input and location with a weight vector to produce weighted input parameters (**Mehrotra,** p11, Figure 1.5; The 'Multiplying the

mass input … with a weight vector' of applicant is the multiplication of each x_is and w_is in node 'f' of Mehrotra.); summing together weighted input parameters and a bias value to generate a summed value (**Mehrotra,** p11, Figure 1.5; The 'summing' of applicant is the summation of the products of all the x_is and w_is in node 'f' of Mehrotra.); applying a neuron transfer function. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by generating a product by means of input data and weights as taught by Mehrotra to multiplying the mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value; applying a neuron transfer function.

For the purpose of using standard neural network methods for producing reliable results.

Boller teaches to the summed value to generate an aeroelastic analysis flutter result (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach wherein the aeroelastic analysis flutter result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the flutter result.

Luxhoj teaches wherein the aeroelastic analysis flutter result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight

(**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.); and outputting the flutter result. (**Luxhoj,** p390:18 through p391:6; 'Outputting' of applicant is equivalent to 'output values of a PNN' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by determining aeroelastic flutter as taught by Luxhoj to have wherein the aeroelastic analysis flutter result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and outputting the flutter result.

For the purpose of determining if the aircraft is safe to fly.

Claim 30

Boller, Luxhoj and Mehrotra do not teach means for receiving input parameters relating to a completed repair of an aircraft structure.

NMAB_497 teaches means for receiving input parameters relating to a completed repair of an aircraft structure. (**NMAB-497,** p11:8-25; 'Input parameters' of applicant is illustrated by 'materials and processes' of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting data into the invention as taught by NMAB_497 to have means for receiving input parameters relating to a completed repair of an aircraft structure.

For the purpose of having the ability to use the invention.

Boller and Luxhoj do not teach means for applying a neural network transfer function.

Mehrotra teaches means for applying a neural network transfer function. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + ...+ w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by viewing the results of a neural network as a transfer function as taught by Mehrotra for applying a neural network transfer function.

For the purpose of generating a accurate result.

Boller teaches to the input parameters to generate an aeroelastic analysis result (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller.)

Boller does not teach wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and means for outputting the result.

Luxhoj teaches wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight (**Luxhoj,** p382:1-24; 'Completed repair are acceptable' of applicant is equivalent to 'airworthiness' of Luxhoj.); and means for outputting the result. (**Luxhoj,** p390:18 through p391:6; 'Outputting the results' of applicant is equivalent to 'output values of a PNN' of Luxhoj.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by determining aeroelastic

analysis as taught by Luxhoj to have wherein the aeroelastic analysis result may be used to determine whether the aircraft structure with the completed repair is acceptable for flight; and means for outputting the result.

For the purpose of for determining if the aircraft is safe to fly.

Claim 31

Boller, Luxhoj and Mehrotra do not teach wherein the one or more input parameters relating to a completed repair of the structure relate to a repair performed on an aircraft.

NMAB_497 teaches wherein the one or more input parameters relating to a completed repair of the structure relate to a repair performed on an aircraft. (**NMAB-497,** p11:8-25; ‘Input parameters relating to a completed repair’ of applicant is illustrated by ‘materials and processes’ of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant’s invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting repair information into the invention as taught by NMAB_497 to have wherein the one or more input parameters relating to a completed repair of the structure relate to a repair performed on an aircraft.

For the purpose of inputting data into the invention so that the invention can produce information pertaining to the repairs being approved or not.

Claim 32

Boller teaches wherein the at least one aeroelastic analysis result is generated after the completed repair is completed and before the aircraft is used for flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller. 'Repair' of applicant is equivalent to 'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 35

Boller and Luxhoj do not teach wherein at least one of the weight and the location of the weight on the structure exceed a predetermined category of approved repair parameters.

Mehrotra teaches wherein at least one of the weight and the location of the weight on the structure exceed a predetermined category of approved repair parameters. (**Mehrotra,** p11 Figures 1.5, 1.6; 'Exceed a predetermined category' of applicant is illustrated by the results of the output node based on the step function. Below a given net value the output is 'off' and above a given net value the output is 'on' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by having input data which is important to the aircraft performance as taught by Mehrotra to have wherein at least one of the weight and the location of the weight on the structure exceed a predetermined category of approved repair parameters.

For the purpose of inputting important data which is connected to the flight characteristics of an aircraft.

Claim 36

Boller teaches wherein the structure is an aircraft. (**Boller,** abstract)

Claim 37

Boller teaches wherein the step of determining aeroelastic characteristics of the structure based in part on the trained neural network is performed after the completed repair is completed and before the aircraft is used for flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic characteristics' of applicant is equivalent to 'aeroelasticity' of Boller. 'Repair' of applicant is equivalent to 'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 38

Boller does not teach wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft.

Luxhoj teaches wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft. (**Luxhoj,** Fig. 4) It would have been obvious to a person having ordinary

skill in the art at the time of applicant's invention to modify the teachings of Boller by employing the invention on a portion of an aircraft as taught by Luxhoj to have wherein the structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft.

For the purpose of using the invention which is effected by aeroelastic analysis, such as a aircraft section.

Claim 39

Boller and Luxhoj do not teach wherein the neural network is a feed forward neural network.

Mehrotra teaches wherein the neural network is a feed forward neural network. (**Mehrotra,** p103:1 through p104:16; 'Feed forward neural network' of applicant is equivalent to 'feedforward network' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using a feed forward design as taught by Mehrotra to have wherein the neural network is a feed forward neural network.

For the purpose of using a reliable neural network design for accurate results.

Claim 40

Boller, Luxhoj and Mehrotra do not teach wherein the step of determining input parameters further comprises: determining a weight; and determining a location of the weight relating to the one or more completed repairs performed on the structure.

NMAB_497 teaches wherein the step of determining input parameters further comprises: determining a weight; and determining a location of the weight relating to the one or more completed repairs performed on the structure. **(NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting weight and location of the repairs as taught by NMAB_497 to have wherein the step of determining input parameters further comprises: determining a weight; and determining a location of the weight relating to the one or more completed repairs performed on the structure.

For the purpose of evaluating the repairs to determine if the repairs are approved.

Claim 41

Boller, Luxhoj and Mehrotra do not teach wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

NMAB_497 teaches wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting information concerning weight and location of the repair as taught by NMAB_497 to have wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

For the purpose of evaluating the repair to verify if the repair can be approved.

Boller and Luxhoj do not teach exceed a predetermined category of approved repair parameters.

Mehrotra teaches exceed a predetermined category of approved repair parameters. (**Mehrotra,** p11 Figures 1.5, 1.6; 'Exceed a predetermined category' of applicant is illustrated by the results of the output node based on the step function. Below a given net value the output is 'off' and above a given net value the output is 'on' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at

the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using thresholds as taught by Mehrotra to exceed a predetermined category of approved repair parameters.

For the purpose of using thresholds as a measure to indicate approved repairs for the aircraft.

Claim 42

Boller and Luxhoj do not teach wherein the step of applying the predetermined neural network transfer function.

Mehrotra teaches wherein the step of applying the predetermined neural network transfer function. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using a function as taught by Mehrotra to have wherein the step of applying the predetermined neural network transfer function.

For the purpose of generating a final result for comparison which leads to a final decision.

Boller teaches to the at least one input parameter to generate the aeroelastic result is performed after the completed repair is completed and before the aircraft structure is used in flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic result' of applicant is equivalent to 'aeroelasticity' of Boller. 'Repair' of applicant is equivalent to

'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 43

Boller teaches wherein the step of applying the predetermined neural network transfer function to the at least one input parameter to generate the aeroelastic analysis result is performed after the completed repair is completed and before the aircraft structure is used in flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller. 'Repair' of applicant is equivalent to 'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 44

Boller does not teach wherein the aircraft structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft.

Luxhoj teaches wherein the aircraft structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft. (**Luxhoj,** Fig. 4) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Boller by using the invention on a portion of an aircraft as taught by Luxhoj to have

wherein the aircraft structure is at least one of a stabilizer, a wing, an elevator, a canard, an aileron, a flap, a spoiler, a stabilizer, a tail section, and a rudder of an aircraft.

For the purpose of using the invention which can be effected by aeroelastic analysis.

Claim 45

Boller, Luxhoj and Mehrotra do not teach wherein the step of receiving the at least one input parameter comprises: receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure.

NMAB_497 teaches wherein the step of receiving the at least one input parameter comprises: receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting weight and location of a repair as taught by NMAB_497 to have wherein the step of receiving the at least one input parameter comprises: receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure.

For the purpose of using the invention to evaluate the repairs for flight approval.

Claim 46

Boller, Luxhoj and Mehrotra do not teach wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

NMAB_497 teaches wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting weight and location of an repair as taught by NMAB_497 to have wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

For the purpose of using the invention to evaluate the repairs for flight approval.

Boller and Luxhoj do not teach exceed a predetermined category of approved repair parameters.

Mehrotra teaches exceed a predetermined category of approved repair parameters. (**Mehrotra,** p11 Figures 1.5, 1.6; 'Exceed a predetermined category' of

applicant is illustrated by the results of the output node based on the step function. Below a given net value the output is 'off' and above a given net value the output is 'on' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using thresholds as taught by Mehrotra to exceed a predetermined category of approved repair parameters.

For the purpose of using thresholds, if surpassed would indicate approved repairs.

Claim 47

Boller and Luxhoj do not teach wherein the step of applying the neuron transfer function to the summed value.

Mehrotra teaches wherein the step of applying the neuron transfer function to the summed value. (**Mehrotra,** p11, Figure 1.5; The 'summing' of applicant is the summation of the products of all the x_is and w_is in node 'f' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by using summation as taught by Mehrotra to have the neuron transfer function to the summed value.

For the purpose of summing the products of weights and data to be used for comparison purposes.

Boller teaches to generate the aeroelastic flutter result is performed (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic flutter' of applicant is equivalent to

'aeroelasticity' of Boller.) after the completed repair is completed and before the aircraft structure is used in flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Repair' of applicant is equivalent to 'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 48

Boller and Luxhoj do not teach wherein the neural network transfer function is applied to the input parameters.

Mehrotra teaches wherein the neural network transfer function is applied to the input parameters. (**Mehrotra,** p11, Figure 1.5; The 'transfer function' of applicant is equivalent to '$f(w_1x_1 + \ldots + w_nx_n)$' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj by employing the neural network as taught by Mehrotra to have wherein the neural network transfer function is applied to the input parameters.

For the purpose of using the algorithms and methods which are associated with the neural network, for classification purposes.

Boller teaches to generate the aeroelastic analysis result after the completed repair is completed and before the aircraft structure is used in flight. (**Boller,** Fig. 14, p396, C2:19-34, abstract; 'Aeroelastic analysis' of applicant is equivalent to 'aeroelasticity' of Boller. 'Repair' of applicant is equivalent to 'repair' of Boller. 'Before the aircraft is used for flight' of applicant is equivalent to 'repair has to be qualified' of Boller.)

Claim 49

Boller, Luxhoj and Mehrotra do not teach receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure.

NMAB_497 teaches receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure. **(NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by inputting information about the weight and location as taught by NMAB_497 to receiving a weight; and receiving a location of the weight relating to the completed repair of the aircraft structure.

For the purpose of evaluating the aircraft to check if the repairs altered the aircraft's tolerances and performance characteristics.

Claim 50

Boller, Luxhoj and Mehrotra do not teach wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

NMAB_497 teaches wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure. (**NMAB-497,** p11:8-25; 'Weight and location on the structure' of applicant is illustrated by 'materials and processes' of NMAB-497. It is the Examiner's opinion that one skilled within the art would understand that both the location of the repair and the mass of the materials used for the repair is critical information for analysis of the repair. This is due to following the repair both aerodynamics and the center of gravity of the aircraft can be altered.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller, Luxhoj and Mehrotra by entering weight and location into the invention as taught by NMAB_497 to have wherein the weight and the location of the weight relating to the one or more completed repairs performed on the structure.

For the purpose of evaluating the aircraft to check if the repairs altered the aircraft's tolerances and performance characteristics.

Boller and Luxhoj do not teach exceed a predetermined category of approved repair parameters.

Mehrotra teaches exceed a predetermined category of approved repair parameters. (**Mehrotra,** p11 Figures 1.5, 1.6; 'Exceed a predetermined category' of applicant is illustrated by the results of the output node based on the step function. Below a given net value the output is 'off' and above a given net value the output is 'on' of Mehrotra.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Boller and Luxhoj

by using thresholds as taught by Mehrotra to have a predetermined category of approved repair parameters.

For the purpose of indicating classification of an approved repair if the threshold is surpassed.

Conclusion

3. The prior art of record and not relied upon is considered pertinent to the applicant's disclosure.

-'Next generation structural health monitoring and its integration into aircraft design': Boller

-'Comparison of regression and neural network models for prediction of inspection profiles for aging aircraft': Luxhoj

-'Using neural networks to predict component inspection requirements for aging aircraft': Shyur

4. Claims 1-13, 16-50 are rejected.

Correspondence Information

5. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 272-3150 (for formal communications intended for entry.)

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on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

/P. C./

Examiner, Art Unit 2129

Peter Coughlan

3/5/2008

/Joseph P. Hirl/

Primary Examiner, Art Unit 2129